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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/534,815	05/13/2005	Kia Silverbrook	MJT010USNP	9059

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SILVERBROOK RESEARCH PTY LTD
393 DARLING STREET
BALMAIN, 2041
AUSTRALIA

EXAMINER

STEPHENS, JUANITA DIONNE

ART UNIT	PAPER NUMBER
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2853

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/22/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/534,815	SILVERBROOK, KIA	
	Examiner	Art Unit	
	Juanita D. Stephens	2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Application filed 5/13/2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-47 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 May 2005 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>11/13/2006, 5/13/2005</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Information Disclosure Statement

1. Acknowledgement is made of the Information Disclosure Statement filed 11/13/2006 and 5/13/2005.

Specification

2. The disclosure is objected to because of the following informalities:

The "CROSS-REFERENCE TO RELATED APPLICATIONS" section is missing.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-5, 7-8, 11-12, 16-20, 22-23, 26-27, 31-34, 36-37, 40-41 and 45-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6,019,457) in view of The Fabrication of Reliability Testing of Ti/TiN Heaters (DeMoor).

Silverbrook discloses a method of ejecting a drop of a bubble forming liquid from a printhead, and a printer system incorporating a printhead (Fig. 12 and 17) comprising:

1) a plurality of nozzles (col 8, ln 66-col 9, ln 1), **2)** at least one respective heater element (120) corresponding to each nozzle, **3)** wherein each heater element is arranged for being in thermal contact with a bubble forming liquid (ink 106), **4)** each heater element configured to heat at least part of the bubble forming liquid to a

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temperature above its boiling point to form a gas bubble therein thereby to cause the ejection of a drop of the bubble forming liquid through the nozzle corresponding to that heater element, **5)** wherein the bubble which each heater element is configured to form is collapsible and has a point of collapse, and wherein each heater element is configured such that the point of collapse of a bubble formed thereby is spaced from the heater element (as shown by the shape of the heater element 120 in Fig. 10-12), **6)** being configured to support the bubble forming liquid in thermal contact with each said heater element, **7)** a page-width printhead (col 2, Ins 19-20), **8)** wherein each heater has an actuation energy of less than 500 nanojoules (nJ) (col 19, Ins 8-10), **9)** configured to receive a supply of the bubble forming liquid at an ambient temperature, wherein each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of said drop is less than the energy required to heat a volume of said bubble forming liquid equal to the volume of said drop, from a temperature equal to said ambient temperature to said boiling point, **10)** a structure (overcoat 142) that is formed by chemical vapor deposition (CVD), said nozzles being incorporated on the structure (col 9, Ins 8-10; col 29, Ins 66-67), **11)** a structure which is less than 10 microns thick (col 8, Ins 65-66; col 9, Ins 8-10), and **12)** wherein each nozzle has a nozzle aperture and defines an axis extending through the nozzle aperture, wherein the point of collapse is disposed on the axis and wherein the element (120) is configured so that the element is spaced from the axis (as shown in Figs. 12 and 17).

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Silverbrook does not disclose 1) each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50, and 2) wherein said atomic number is below 30, 3) wherein said atomic number is below 23). DeMoor at least teaches that it is desirable to use a heater made of Ti/TiN (Ti has an atomic number of 22) in integrated MEMS systems (a thermal inkjet is such a system), because the material provide the advantages of CMOS fabrications (low cost and uniformity) in combination with a very high reliability (see Conclusion). It would have been obvious at the time the invention was made to a person having ordinary skill in the inkjet art to modify Silverbrook by providing the Ti/TiN heater as taught to be old by DeMoor, for the purpose of providing advantages of CMOS fabrication in combination with high reliability.

The method of claims 31-34, 37, and 47 are disclosed in Silverbrook in view of DeMoor as discussed above with respect to the apparatus.

5. Claims 6, 10, 15, 21, 25, 30, 35, 39, and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6,019,457) in view of The Fabrication of Reliability Testing of Ti/TiN Heaters (DeMoor) as applied to claims 1-5, 7-8, 11-12, 16-20, 22-23, 26-27, 31-34, 36-37, 40-41 and 45-47 above, and further in view of Kubby (US 5,706,041).

Silverbrook teaches the claimed invention, with the exception of 1) wherein each heater element is in the formed of a suspended beam, that is suspended over at least a portion of the bubble forming liquid so as to be in thermal contact therewith, 2) wherein

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each heater element has a pair of planar surfaces on opposite sides of the element, that element being suspended such that each of the planar surfaces is in thermal contact with the bubble forming liquid such that the bubble is formed at both of the element surfaces, and **3)** wherein each heater is substantially covered by a conformal protective coating, such that the coating is seamless. Kubby at least teaches wherein each heater element is in the form of a suspended beam, that is suspended over at least a portion of the bubble forming liquid so as to be in thermal contact therewith (col 3, lns 50-51), wherein each heater element has two opposite sides and is configured such that said gas bubble formed by that heater element is formed on both of said sides (abstract; col 4, lns 47-65; col 5, lns 8-16), and wherein each heater is substantially covered by a conformal protective coating (col 4, lns 11-17). It would have been further obvious at the time the invention was made to a person having ordinary skill in the ink jet art to modify Silverbrook in view of DeMoor by providing the heating element as taught to be used by Kubby for the purpose of dissipating heat from the heating element more efficiently, preventing wasted heat from accumulating within the printhead.

The method of claims 39 and 44 are disclosed in Silverbrook in view of DeMoor and further in view of Kubby as discussed above with respect to the apparatus.

6. Claims 9, 24, and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (6,019,457) in view of The Fabrication of Reliability Testing of Ti/TiN Heaters (DeMoor) as applied to claims -5, 7-8, 11-12, 16-20, 22-23, 26-27, 31-34, 36-37, 40-41 and 45-47 above, and further in view of Feinn et al. (US 6,543,879 B1).

Silverbrook in view of DeMoor teaches the claimed invention, with the exception of having a nozzle density of at least 10,000 nozzles per square cm. Feinn et al. at least teaches an ink jet print head having a nozzle density of at least 10,000 nozzles per square cm (Abstract). It would have been further obvious at the time the invention was made to a person having ordinary skill in the ink jet art to have provided Silverbrook in view of DeMoor with a nozzle density of at least 10,000 nozzles per square cm as taught to be old by Feinn et al. for the purpose of improving resolution.

The method of claims 38 are disclosed in Silverbrook in view of DeMoor and further in view of Feinn et al. as discussed above with respect to the apparatus.

7. Claims 13, 28 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (6,019,457) in view of The Fabrication of Reliability Testing of Ti/TiN Heaters (DeMoor) as applied to claims 1-5, 7-8, 11-12, 16-20, 22-23, 26-27, 31-34, 36-37, 40-41 and 45-47 above, and further in view of Komuro (US 4,965,594).

Silverbrook in view of DeMoor teaches the claimed invention, with the exception of the heater being formed on different layers. Komuro at least teaches an inkjet print head having a heater that is formed in a plurality of different layers (col 3, lns 35-65, as seen in Fig. 1). It would have been further obvious at the time the invention was made to a person having ordinary skill in the ink jet art to modify Silverbrook in view of DeMoor by providing a heater that is formed in a plurality of different layers as taught to be old by Komuro for the purpose of enabling drops of different sizes to be ejected in order to produce a gradated recording.

The method of claims 42 are disclosed in Silverbrook in view of DeMoor and further in view of Komuro as discussed above with respect to the apparatus.

8. Claims 14, 29, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (6,019,457) in view of The Fabrication of Reliability Testing of Ti/TiN Heaters (DeMoor) as applied to claims 1-5, 7-8, 11-12, 16-20, 22-23, 26-27, 31-34, 36-37, 40-41 and 45-47 above, and further in view of Yamashita et al. (US 5,969,005).

Silverbrook in view of DeMoor teaches the claimed invention, with the exception of wherein each heater element is configured for a mass of less than 10 nanograms. Yamashita et al. at least teaches that the ink is jetted at an output of from 1 to 70 nanograms per droplet to effect recording (abstract, col 30, lns 29-32, lns 38-40; col 31, lns 18-22). It would have been further obvious at the time the invention was made to a person having ordinary skill in the ink jet art to modify Silverbrook in view of DeMoor with the output of 1 to 70 nanograms per droplet to effect recording as taught to be old by Yamashita et al. for the purpose of providing a greater surface area of the droplet, thus strongly improving image quality.

The method of claim 43 are disclosed in Silverbrook in view of DeMoor and further in view of Yamashita et al. as discussed above with respect to the apparatus.

Contact Information

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juanita D. Stephens whose telephone number is (571)

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272-2153. The examiner can normally be reached on Flex (Monday-Thursday 9:00 am -6:00 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JUANITA D. STEPHENS
PRIMARY EXAMINER



JDS
March 18, 2007

Juanita D. Stephens
Primary Examiner
Art Unit 2853